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**DEVELOPMENTAL TECHNIQUES AS STRUCTURAL TOOLS: A
COMMENTARY ON THEIR APPLICATION IN MY RECENT MUSIC**

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in partial fulfilment of the requirements for
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Abstract

This thesis details my approaches to composition, focusing on methods of using development processes and techniques to benefit the structure of the work, with the goal of developing new methods and ideas to generate continuous material progression in my compositions. It reflects on my position as a composer coming into the project and which areas of my approach I wished to develop or change. The paper proceeds to focus on additive techniques with reference to minimalism, followed by studies on number patterns in relation to Tom Johnson and how he combines music and mathematics. I explore a new method of structuring compositions to assist constant material development and focus on a number of techniques I use to progress my music as part of this. These areas of focus include displacement, isorhythm and canon, and I analyse how successful these approaches are in a number of compositions and studies. In support and reference to these techniques I focus in on works by Ligeti and Nancarrow, examining how their approaches have directly or indirectly influenced my own.

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Word Count: 7,508

Portfolio of compositions

Expanse for solo cello (November 2009)

Study No.1: Ascension for piano (July 2011)

Study No.2: Short for piano (November 2010)

Study No.3: Short Shrift for percussion (October 2010)

Alphabet Automaton for keyboard instrument (March 2011)

Developmental techniques as structural tools: A commentary on their application in my recent music

As an undergraduate composer I became very interested in process, and particularly additive techniques and those with a basis in mathematics. This came about from discovering composers such as Andriessen, with his heavily jazz-influenced style, Birtwistle, and composers whose music touched on minimalism such as Michael Gordon and György Ligeti. From these influences, a tendency towards minimal materials and high tempos became a feature of my music, with additive techniques becoming my most commonly used technique. Although these were early compositions, and I was still very much discovering my own writing style, certain structural aspects reoccurred across my output from this period. My work was often in block form, and I treated material in short passages to a point where I was satisfied by its progression. Repetition was a key feature, spurring from my background in popular music combined with the influence of minimalism. Gradual transformations on the original theme formed a large amount of the music, fashioned through the additive techniques which had so captured my interest.

These techniques served me well at the time, and with the benefit of hindsight I feel I wrote some effective pieces. However, over the past two years whilst working on this project I have made efforts to take my use of process further. I was dissatisfied with block form as being as a habitual structure, and felt that the fact my work was routinely taking this form was a by product of my inability or subconscious reluctance to stretch ideas to a longer duration. I sought far more continuity in my writing. These considerations led to a study of other ways in which I could use processes in a more structural, as well as melodic, developmental manner.

Over the course of this paper, I will be exploring a number of compositional techniques that have been at the forefront of my compositional output over the past two years, analysing how I treat them in my work, and their relative effectiveness. The manner in which certain composers might have influenced me in my thinking will also be taken in to consideration, from their conceptual attitudes towards composition through to ways in which certain techniques and works have directly influenced my own music. This includes in depth discussion on the work and methods of composers such as György Ligeti, Tom Johnson and Conlon Nancarrow.

Firstly, I reflect on how additive techniques form the undercurrent to all of my work, deliberately or otherwise, with a focus on the first composition of the project, *Expanse*. From this point I widen my study to discuss how the mathematical aspect of this appeals to me, in the form of number

patterns and sequences as well as looking at how I've worked with traditional techniques such as isorhythm, canon and hocketing to find methods of achieving my intentions. Around this I test new approaches to setting out predefined small and large scale forms to remove some decisions from my control.

Due to the scale of this project a number of areas which were of interest are discussed less, or not at all. Although such elements as harmony are included in the important compositional decisions I have to make as a composer, they hold little importance to the subjects discussed here, which are specifically with regards to the form of the material and its relationship to the greater structure, rather than the internal relationships which occur as a result. Other areas that are not examined in detail include dynamics and timbral instruction, both of which there are little in my compositions. I do not feel such things are essential for the nature of many of the works in this project, namely study pieces and technical experiment on one or more ideas. The focus of my research is intentionally towards micro elements of my work, and in particular the technical aspect of my music, and so only when relevant to the key topics of the paper shall I be making references towards musical features such as these.

1. Additive techniques and *Expanse*

The first composition I completed on beginning this course was a work for solo cello entitled *Expanse*, which was written for a workshop and concert performance by Neil Hyde. The whole piece was formed from a set series of expanding intervals, introduced one at a time initially, before being shifted and explored rhythmically across the instrument's range.



Example 1: Expanding pitch series used in Expanse.

I approached this piece with the intention to explore new approaches towards material, primarily to escape the high tempo and repetitive style I had previously tended towards. However, *Expanse* clearly still carries these characteristics, and others common in my early work. The placing of higher significance on certain pitches is one, and the material in this piece shows this through the way, in each section, one pitch is forming the foundation, and is the destination to which the music continually returns. As you will see from the extracts that make up example 2,

the material is formed in a scalic fashion and there is regularity about the way the material is processed.



Example 2a: Bars 40 – 43 of *Expanse*



Example 2b: Bars 55–58 of *Expanse*



Example 2c: Bars 208–211 of *Expanse*

Example 2b in particular, which is made up of fast, ascending material, displays these minimalist characteristics I had been originally intending to avoid. It begins with four pitches – D# (Eb), E, F and Ab – with an octave higher D# shortly added. I proceeded to add all four pitches an octave higher. The listener should be aurally aware of the simple octave shift, and this establishes the short scale as a reference point, despite altering the pattern occasionally through octave displacement and adding in extra notes to the sequence, as well as using quintuplets and sextuplets to shift the rhythmic pacing. I then interrupt this established pitch set through the introduction of new, unrelated ones – Gb, A, Bb and C (simply the unused pitches from my chosen series). Introducing these pitches one at a time slowly increases the time the listener has to wait and anticipate a return to the base pitch, Eb. Additive techniques have proven to be extremely common in my work, and are one of the fundamental characteristics of the music written by minimalist composers. For example, in Philip Glass' *Two Pages* (1968), the main theme is based on an initial, recurring G to C perfect fourth, and can be seen to treat pitch in a similar manner to I do in this second section of *Expanse*. The stability of these two pitches is compromised by the increasing presence of a F, D and Eb pattern which, as Wes York observes

in his writings on Glass, *Form and Process*, leads to 'the subtle and steady establishment of F-D-Eb as a more potent centre unto itself'¹. Similar additive techniques can be found in much of his work of this era, such as *Music in Contrary Motion* (1969) and *In Twelve Parts* (1974).

Addition and subtraction are the most commonly used techniques in *Expanse* as a whole. After rapid subtraction to close this previously discussed second section, I again slowly expand material, this time in the form of a slower moving, descending and more fragmented line, with an A, high in the cello's register, acting as the established, returning pitch. In the final section it is subtractive techniques that dominate, reducing the material to a single pitch, the F, with which the whole piece began.

Expanse shows that at the time, using additive processes was my most instinctive method of writing. Despite the simplicity, these are effective methods for when working with short passages of material, and given this, it would be easy to continue writing music this way. Certainly, the piece demonstrates the unworkable nature of my ideas of completely revamping my style of writing. I have many issues with the piece, feeling it lacks structure and direction as well as variation in the use of processes. The only aspect of the piece that I feel is successful is some of the rhythmic intricacy. As a result, I felt a need to reassess how I approached my compositions, and how I could generate more organic, continuous structures using process, to suit both my writing style and my intentions.

¹ York, Wes, *Form and Process*, Writings on Glass: Essays, Interviews, Criticism, Ed. Kostelanetz, Richard (Berkeley, 1999) p.71

2. Developing Triggers

2.1 Number, Pattern and Tom Johnson

I prefer to think of these not as compositional decisions, however, but rather as interpretative decisions. The composer is the automaton itself, and I do not wish to add subjective messages of my own, but simply to interpret, to find the arrangement and colours that allow the automaton itself to be heard as clearly and naturally as possible.²

I find a fascination from things such as number patterns, there being something about the simple logic behind them which I think appeals to my obsessive nature. As a result of this appeal, and exploring the occurrence of such mathematical approaches in contemporary music, I have spent much time reading and studying Tom Johnson's approaches. The music Johnson writes, using the patterns and formulae he discusses in *Self-similar melodies*, holds little direct appeal to me as a composer; it is often very self-contained due to the nature of his chosen technique and usually overly tonal and melodic in character. I respect that Johnson intentionally writes music in this style, and does so successfully, but there is a clear differences in style between the music I choose to write and the music of Johnson. For much of my compositional work up until this year, I had only once found fit to take direct influence from Johnson, creating my own *Perfect Rhythmic Tiling*³ for *Nino 3:11*⁴, its suitability to a $\frac{3}{4}$ signature fitted with my thinking at the time for a faux-waltz melody. The piece in itself had a self-contained character to it, with the three materials I worked with being combined with and manipulated by each other. Developmental processes such as I use in the rest of my work didn't feature in this work hence my excluding it from the main portfolio but, most likely this weaving of materials comes from my interest in cyclic and hocketing material which I will comment on later.

Having commented on the seemingly simplistic and closed approaches of Johnson, it is worth observing how he does view these patterns and processes from a musical viewpoint to find ways of using them for his own needs. In his article *Automatic Music*⁵, he works with a 'go-to' automaton which works as follows:

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- 2 Johnson, Tom, *Automatic Music*, Journées d'informatique musicale (May 1998) (ISBN 2-909669-12-2)
 - 3 Johnson, Tom, *Perfect Rhythmic Tilings* (Lecture delivered at MaMuX meeting, IRCAM, January 24, 2004) <http://www.editions75.com/Articles/Perfect%20Rhythmic%20Tilings.pdf>
 - 4 *Nino: 3:11*, a piece for solo sopranino saxophone, written in collaboration with fellow-postgraduate Chris Jolly, is included as an appendix to my portfolio, for referencing purposes. It was an experiment in working in a new manner, and although aspects of it did work well, there's is little in it which fits with the themes of the rest of the project, namely developmental techniques. There is a weaving of material which perhaps relates to hocketing and cycling, and this subject I will discuss with regards to other pieces later on.
 - 5 Johnson, Tom, *Automatic Music*, Journées d'informatique musicale (May 1998) (ISBN 2-909669-12-2)

1 --> 2
2 --> 3 1
3 --> 1
Begin 2 3 1

The above instructions gave him a slowly building number sequence with interesting twists and patterns from which he then arranged a work for percussion. A mathematician, Jean-Paul Allouche, suggested a reworking of the instructions that in his eyes was far more logical and gave the same pattern.

1 --> 1 2
2 --> 2 3 1
3 --> 3 1

This results in a series which begins with a restatement of the previous level, and which proceeds to expand far faster. For Johnson this is a less interesting sequence due to the fixed beginnings, and the way in which it reduces the length of piece.

It became clear that Allouche and I had different values here; coming from the two different disciplines we had learned. Allouche was looking for a general truth, a way of paring things down to the most essential elements, a way of penetrating the complications and reducing them to general theorems. I was looking for particular situations, curious twisted sets of rules, which produced forms and sequences that one could not find in any other way.⁶

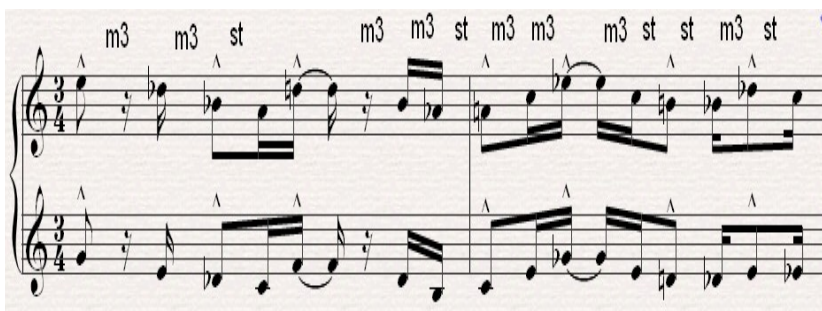
Johnson observes that, as a composer, interesting results from mathematic number patterns are actually harder to come by than they might be for a mathematician who is satisfied by the logic alone. So, despite my separating my approaches from his, on further study it becomes clear Johnson does find different ways to use the series' he works with. Such approaches include allocating each number a pitch, such as in the aforementioned percussion piece for two timpani tuned to different pitches, with the third numeral representing a rest.

But as I have suggested, as interesting as these ideas are to me as an observer, as a composer I have a need for a more complex take if such patterns on surface value are to find their way into

6 Johnson, Tom, *Automatic Music*, Journées d'informatique musicale (May 1998) (ISBN 2-909669-12-2)

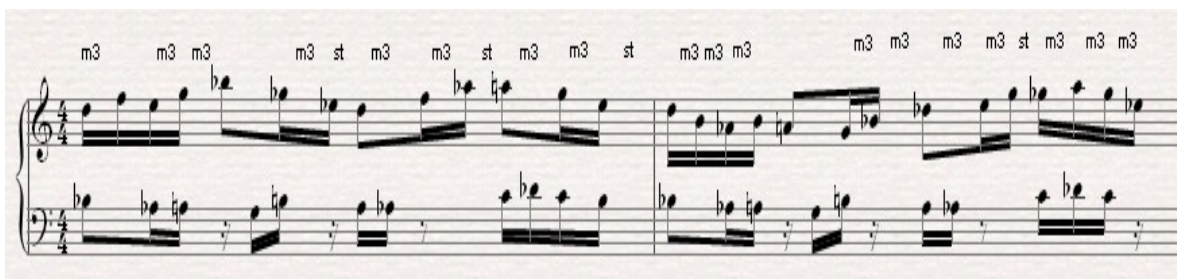
my work, particularly when my focus is on material development. This way of working with the patterns is too contained for my own approach, and Johnson's music does not contain the level of change to the material I seek.

I do believe I have taken influence from his approach in ways beyond the numbers, an example being my approach to pitch, which often is as if working with building blocks or numbers in a pattern, rather than with a set of frequencies. Pitch is principally an element to be processed and reordered in my work. I tend to assemble melodies through alternating intervals from note to note, or by using the intervals to determine the construction of rhythm (or vice versa). These underlying patterns can then become candidates for augmentative or reordering techniques.



Example 3a: Bars 1 and 2 of Study No.2: Short including intervallic make up.

The material for *Short* was based on alternating semitone and minor third steps, as seen above in example 3a. The sole anomaly is the fourth in the first bar between an A and a D. Indeed, the interval of a sixth between the two parts is similarly inspired by this inclination to thirds, and also means the left hand is in one pitch class step behind at all times. The material was designed to naturally descend by a minor third at each new statement, as I consciously wanted the material to be moving in the opposite direction to the ascending scale of triggers, an explanation of which I will get to in the section. Therefore the left hand begins on an E at bar three, although an octave below. On the other hand, the left hand is actually a few steps ahead, as it's lower in its descent.



Example 3b: Bars 1 and 2 of Study No. 1: Ascension including intervallic make up of right hand

The material that begins *Ascension* again is based largely on steps of a minor third and semitones. The left hand is this time independent, and moves in consistently smaller intervals of firsts and seconds for the most part. This independence is key to the way in which I effectively treat each hand as a separate part in this piece, as will become clearer as I discuss further techniques.

From these two beginnings, my tendency towards undulating and flowing, fast and rhythmic material is quite clear, undulations created as a result of these intervallic preferences and an intuitive approach to ascent and descent. The regularity with which I do come up with such material and my wish to explore ways to continually process it would seem to be linked. There's a natural correlation between fast-moving material and a fast-moving structural plan.

Other feasible applications of number in my work have been considered as well. The various levels of any automaton process, expanding as the initial input number increases, could be the model for expanding material, even a structuring device if you take each different figure of the pattern as representative of a passage of material. In my mind, this could perhaps manifest itself in a situation where the number indicates how many processes should be operating at that time.

Alternatively, each number could represent a transformational procedure, to initiate an instant change to material rather than a gradual one. To illustrate this, I have attempted to transfer this idea into a short study to give a visual demonstration of how I would approach such a method in a full-scale composition. In this reduced, controlled experimental approach it is easier to see how certain ideas and processes do or do not work with these simple patterns. This experimental study is entitled *Alphabet Automaton* and is based on a pattern from a chapter from Johnson's book *Self-similar Melodies*, entitled *Transforming by Finite Automaton*⁷. Johnson represents the patterns in this section, as he does in much of the book, in a simple melody form, different

⁷ Johnson, Tom, *Self-Similar Melodies* (Paris, 1996)

numbers equalling a different pitch or duration, or perhaps to indicate whether the next step in a melody is up or down. I wanted to take this approach further in reflection to my own techniques.

I chose a five-letter based pattern, briefly looked at by Johnson, based on the following rules:

A -> BE

B -> AD

C -> C

D -> A

E -> DC

From these rules comes the following sequence:

A BE ADDC BEAAC ADDCBEBEC BEAACADDCCADDCC
ADDCBEBECBEAACBEAACC BEAACADDCCADDCCADDCCBEBECADDCCBEBECC

I then applied an action to each letter, in the form of simple but effective processes reflective of and common in my larger scale compositions. For this particular study, these are deliberately closed techniques that are instantly applicable and restricted in duration.

A – Original material

B – Invert

C – Transposition by a 4th up (if after A/B) or down (if after D/E)

D – Reduce (from end of material)

E – Canon (entry on the 4th pitch of the material)

The material for the study is deliberately simple, and created through a mix of semitone and perfect fourth steps, a method common in the forming of starting material for some of my other compositions. The work isn't for any specific instrument, but it would likely have to be performed by a keyboard instrument due to the occurrences of (often awkward) chords due to the use of canon.



Example 4: Bars 84 to 85 of Alphabet Automaton showing a complex series of chords.

The results are in some way frustrating. Some interesting developments are erased too quickly by a return to the opening material. Passages of material reoccur with increasing repetition and in some ways it feels too much like the music isn't going anywhere. The transpositions however do allow the music to break free from this, heading potentially infinitely in both directions. This is an aspect I value when judging a process's use. Having a process which will expire by itself suits the organic nature I seek for my music, however as a result they can lead to other, potentially more problematic issues.

An aspect that caught my interest, and one that is both a fascinating and annoying regular occurrence in many of the pieces which make up this project and relates somewhat to these organic processes, is the sudden short passages of complex material, which are in stark contrast to the rest of the piece. They often raise the issue of performability, mostly with regards to pitch, in that the music covers too wider range for the pianist to comfortably stretch to at the pace of the music, or similarly clusters chords which require breaking from a naturally spaced chord progression. For example, just in example 4 above, you can see a chord made up of D B and G which stretches a range of an eleventh, not easy for any pianist in this context.

Therefore, as a composer I must make the decision whether I wish to make adjustments to make the piece easier to perform which then break from the processes which I am working with. I am aware that issues of notation are prominent in my work, but I have have consciously avoided exploring this area in depth so as to avoid focusing on to many areas in this one paper. However it is worth noting that, although I will endeavour to notate a piece in a manner most suited to sight reading as necessary, much of the music for this project would still be very difficult to perform . I am always reluctant to make any changes to my intended processes and as a result there was a large part of my thinking during these pieces that I would rather sacrifice a perfect performance, if not performance opportunities as a whole, than make the level of changes that would be required to make every piece comfortable to perform. What is and isn't playable is a fine line, regularly pushed by contemporary composers. Pieces such as *Evryali* by Xenakis come to mind, with its multiple staves of notes which essentially mean the performer must be selective as to which

notes to keep and which to sacrifice, as well as the majority of Nancarrow's player-piano studies. With Nancarrow, this comes about not as a result of complex results from processes but from the number of notes and the layers of cross rhythmic material. This makes most of his music unplayable by a human pianist, and works have been arranged for ensemble to ensure every note can be performed, although still with a high level of difficulty.

I believe it would be quite possible to write pieces which manage to avoid these awkward passages. Simpler material would seem to be one answer but as we saw in the Johnson exercise this does not necessarily eradicate extremities of pitch, nor does it suit my style of writing. This of course comes down to the processes introduced and when transposition and canonic layering is involved as they are in this case, such results are to be expected. A thorough planning of the material and the pitches involved may reduce the number of awkward clusters or extreme ranges but such an approach doesn't actually appeal. For all my interest in making sure processes are accurately realised, the experimentation and the unknown potential results are very much what composition is about for me.

2.2 Structuring

As my discussion of number patterns suggests, I have many reasons to look for further methods of structuring my larger scale works. Such reasons include the complete restriction that resulted from designating an exact process or technique to a recurring number, and issues over how to exactly control the progression and end points of different processes. These ideas have led to my idea of triggers. If using a pattern as above was too restricting, I considered that by keeping some form of marker system but not tying a specific process to it, I could still maintain a progressive structure, restricting my control over it as I had been looking to. I wanted a system where processes would begin, in effect, spontaneously depending upon the state and progression of the music, with these factors being the sole things determining which process I added in next.

There also needed to be a music element to these markers, I felt, that meant they were part of the work but also individual enough to stand out in some way. So for my first piece I took a very simple approach, spreading out four octaves of a C Major scale, a quaver at a time, using random number generation between one and eighty to work out the gap, again in quavers, between pitches. The final C, four octaves above the first, was to signal the end of the piece. I had two bars of material, as seen previously in example 3b, which I stated once before introducing the first note of the scale on the first beat of the third bar.

To allow myself as much freedom to focus solely on material and form as possible, I again consciously chose to explore my ideas through piano studies. If you look at how I approach *Ascension* in particular, however, I feel that the instrumentation for this could as feasibly be open. Two instruments capable of the unusual pitch combinations could perform a stave each. As the composer I would be happy for this to occur, which reflects my abstract approach to these compositions. I pay little heed to the instrument's timbre, for example, and go as far as to give little dynamic instruction beyond instructing the performer that whatever dynamic level he begins at should be maintained as consistently as possible for the duration of the piece. My thinking was entirely on carrying out the method I had devised, and choosing and working through whatever techniques I chose to use. I like working with the theoretical restriction of a single stave, when in reality I have still the entire range of the instrument at my disposal. In addition I saw it as a good canvas to work on layering materials, something which alongside canon techniques, had been prominent in my thinking at the time.

The music begins quite simply, with a clear melodic line, a clarity which continues following the initial couple of process introductions; semitone descent in first the right (on four selected pitches) then left (in four block fragments of material) and then right hand again (the remaining material in blocks). Soon, numerous sequences are happening simultaneously, as one process does not stop as another starts but continues until it either reaches its natural end, or it can no longer operate as the material it was working with no longer exists as a result of another process. As early as bar twenty-two, with the introduction of rhythmic augmentation to the left hand, the settled order is upset, and by bar thirty-six, following the introduction of pitch displacement of the right hand material, and the introduction of triplets to the right hand to create constriction and rhythmic upheaval, we have material that sounds chaotic, despite the control in place.

Below I listed the points where triggers are located in the underlying structure for *Ascension*, and the action which occurs at that point.

Bar No. (beat)	Hand	Action
3(1)	R	Descent by semitone. 4 select pitches across 2 bar material in alternation
10(3)	L	Descent by semitone, in 4 alternate groups.
14(1)	R	Descent of rest of material (excluding first note of bar) by semitones in 4 alternate groups.
22(3)	L	Augmentation.
28(2)	R	Pitch displacement. Transferral of some material into LH.
35(2)	R L	Material is hidden. Processes carry on unseen. Introduction of triplets.

Bar No. (beat)	Hand	Action
36(3)	L	Expansion. Pitches added above or below depending on previous interval and gradually expanded until off range of keyboard
43(2)	R	Material returns.
43(3)	L	Pitches added depending on interval between previous pitches
47(1)	L	Pitch fixed as would have been at this point. Pitch repeats, rhythm fixed, descent continues bar by bar.
48(1)	R	Augmentation. Rests between pitches filled by sustaining previous note. Expansion ends.
56(4)	R	Rhythm fixed. Pitch continues to move, setting up isorhythm.
58(4)	L	Pitch released. Follows movement of Right hand.
66(2)	R	Quaver rests introduced to break up isorhythm
73(3)	L	Delay to set material as canon of RH.
79(1)	R	Lowest material dropped to LH. Material gradually constricted.
81(3)	L	Pitch additions in thirds and semitones
83(2)	R	Fifths added above
88(1)	L	Reduction of rests
89(3)	R	Addition of pitches thirds below.
94(3)	L	Descent accelerated
101(2)	R	Descent accelerated
107(2)	L+R	Piece ends

Some of the key observations and comments to be made with regards to *Ascension*, and the success of this particular approach to structuring the piece's development, in my opinion, include the effect the varying durations between the triggers has on the pacing of the music and my success at controlling the material. For example, there are two triggers at bar forty-three, followed by two more at bars forty-seven and forty-eight. There is consequently a rapid change in the style of the piece at this point, which also owes a lot to the nature of the actions occurring. The addition of pitches depending on previous intervals makes a dramatic impact where the intervals are wide, for example a fifth or more, as lines rapidly break out from the rest. Fixing the pitch shortly after this has a reverse effect, creating a static feel in contrast to the fast-moving material of the first part of the piece.

Overall I feel the pacing of the work is good. The opening couple of pages are fairly constant in material style, as I work on building up processes, and I feel you can sense three or four sections to the piece, determined by sets of material with clear individual characteristics. This is obviously surprising as the piece is not divided into sections at all. As the end approaches, material

descends faster than it has to that point, with material dropping out as it reaches the bottom of the keyboard. This means the piece ends thin in texture with just a few notes in the right hand surviving to the penultimate bar. Although I was conscious that it could be seen as cliché, I always intended to have the piece end in this way, with material cascading dramatically into the lowest range of the instrument. The way the material breaks up I believe means that this situation is avoided.

2.3 Control and Cycles in György Ligeti's *Études*

I have yet to learn of another composer who works in this exact way, however I believe another important influence on my thinking for these trigger-based pieces has been György Ligeti, and in particular his many *Études pour piano*. I discovered the études as an undergraduate and can still recall being inspired by my first hearing of *Désordre*, a piece which, to me, demonstrates the fantastic results that can come from initiating the simplest of processes. Ligeti disrupted the unison between the two hands by introducing a 7/8 bar to the right hand part every four bars. Very quickly a weaving texture has been created as the two lines cycle in and out of synch, an effect added to by the fact the phrasing in the right hand part is longer than that in the left. It is perhaps possible to trace my idea for a rising scale as the source of triggers in my piano studies to this piece, in which the material is continually rising. The theme begins a step further up the heptatonic scale each time, and continues to climb over two octaves over the duration of the piece.

Furthermore, the bar lengths become progressively shorter, creating a feeling of acceleration. The piece begins in 8/8 with a 7/8 every fourth, and gets reduced to 4/8 by the tenth statement of the theme. The flowing hemiola scales are gradually disrupted and diminished and the material becomes edgy. It is a masterful demonstration of transforming and processing material, and as well as how to generate a feel of acceleration without increasing the tempo. Although there are differences stylistically, these techniques are ones I admire and use as inspiration for the techniques I explore in my own work. I share an attraction to scalar and sequential material like Ligeti, which is very naturally suited to a processed treatment, and I have previously worked with similarly, relatively simple rhythmic units as well. I now look for more complexity and variation on this front however, which renders such controlled development harder. This was shown by example 4 from *Alphabet Automaton* previously, which I have talked about with relation to patterns before, and the short passages of syncopation which occur. On this scale it is beneficial in breaking up the monotony of the otherwise simple study, and although it leads to some awkward notation, it's a justifiable and manageable occurrence. But as we expand the scale of

development, we see how rhythmic development could easily be allowed to run towards an unmanageable complexity. In *Study 2: Short*, this occurs very rapidly, given it is designed to be a compressed take on the larger scale trigger compositions. In example 6 you can see that there are two lines going in each hand. This is not too much of an issue in the right hand due to there being fewer notes. The left hand material on the other hand is denser and rhythmically more challenging. The one thing in the pianist's favour is that the range is relatively narrow compared to passages in some of my other works.



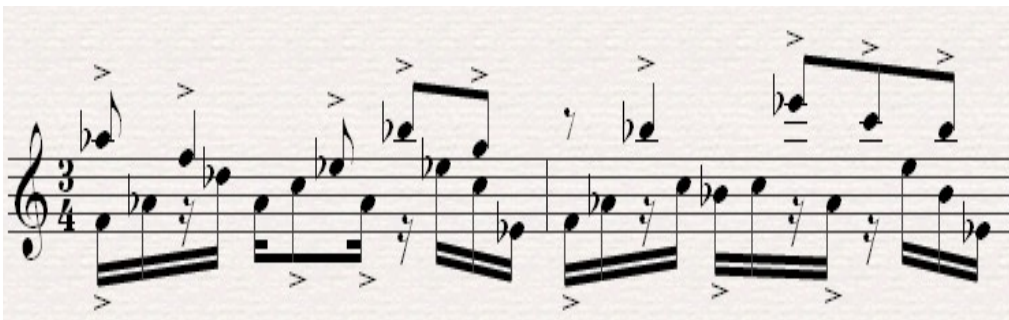
Example 6: Bars 15 and 16 of Study No.2: Short, showing the complexity derived from creating multiple layers of material in a short passage of time.

3. Further Techniques

3.1 Displacement and Hocketing

Another aspect of Ligeti's work which links in with my thinking is the cyclic nature of some of his materials. *Désordre* is one of the études to demonstrate this; another is number thirteen, *Vertige*. Starting with the simplest of material, a descending chromatic scale, Ligeti introduces overlaps between entries as well as adding pitches to the scales meaning there's a continuous expansion happening. Despite the amount going on within the music, on the surface it feels in suspension. The performer is instructed to make each entry clear and maintain each scale's identity. The entries are rising and the scales are descending further and this is audible to the listener, but still the music seems to be looping over and over. The result is a torrent of descending scales creating an aural confusion which sounds static and somehow in suspension, whilst the scales continue to enter higher, and descend further.

I am also fascinated by cycling material; the ways in which certain material can have the feel of constantly looping, whether it be in the form of constantly descending scales that never reach their apparent destination, or something which gives the impression it is literally circling. In my trigger studies I always begin, either through the way I write the material, or through an early process initiation, by setting the music into a constant descent. This is to create the cross-over effect I discussed earlier. Whilst this descent is always occurring, I also use techniques such as hocketing and displacement to shift material out of this continuous one directional movement. Firstly this breaks up some of the monotony which can occur in music such as I write and secondly it helps me build and create new layers of materials, adding another layer of complexity. When material rises out from the rest, particularly to a higher octave I do tend to envisage it as another line, such as in *Short Shift*, my third study, written for percussion, as in example 7 below.



Example 7: Bars 90 and 91 of Study No.3: Short Shift, illustrating separate layers of the melodic line.

However, ahead of both of these aspects I imagine this to be like waves or spirals; that the music is continuously falling but never reaching ground, until I allow it right at the end. The goal is a similar feeling of suspense that Ligeti achieves in *Vertige*. Through exploring a wide range of techniques I enjoy how quickly, and often unexpectedly, material can be shifted between stasis and high energy or movement.

In both *Ascension* and *Short* there are points where I choose to move material from one line to another. In *Short*, it's rather sudden as I change the clef in the left hand, moving layers of the piece to that stave and introduce a new idea to the right hand. My approach is more gradual and subtle in *Ascension*. I've laid out the progression below in example 8, showing how the material drops out of the upper line and takes position in the lower. For me this technique is useful for opening up material, and for breaking up dense lines. It can lead to interesting new figures or pitch combinations, or just allow for simple augmentation or expansion techniques to operate. Just by the fact I always set my material into a continuous descent, pitches will often shift from the treble stave into the bass naturally. I simply choose to experiment with the regularity with which this happens.

The image displays three systems of musical notation for piano, labeled 28, 30, and 32. Each system consists of a grand staff with a treble and bass clef. The music is written in 4/4 time. The notation shows a continuous descent of material from the treble stave to the bass stave. In system 28, the treble staff has a series of eighth notes descending, while the bass staff has a series of eighth notes ascending. In system 30, the treble staff has a series of eighth notes descending, while the bass staff has a series of eighth notes ascending. In system 32, the treble staff has a series of eighth notes descending, while the bass staff has a series of eighth notes ascending. The notation is in black ink on a white background. There are some red and blue markings on the notes, possibly indicating specific pitches or intervals.

Example 8: Bars 28, 30 and 32 from *Ascension* showing pitch displacement.

3.2 Isorhythm

In looking at ways to develop material, whilst also thinking about working more with cyclic material, I began studying composers who worked with isorhythms. Largely, this involved revisiting Conlon Nancarrow, whose work is undeniably fascinating for his instrument of choice alone, before we even get to his wonderfully complex writing. Over the course of more than fifty player piano studies Nancarrow explores pitch rows, isorhythm, rhythmic and tempo canons, and other variations on this theme, and this list is just an overview.

“Perhaps it is exactly because Nancarrow was not running around writing orchestra pieces... like most composers that his invariant medium forced so much variety from him... Any four of these might have sustained another composer’s entire technical vocabulary”⁸

If nothing else this sheer variety of experimentation makes Nancarrow a fascinating study and of interest in relation to almost any area I have chosen to look at.

Although an ancient technique, used by composers such as Philippe de Vitry in the ars nova style of the 14th century, its use can be seen in the work of many of the composers I have touched on. In the case of Conlon Nancarrow, observers believe that his interest in this technique stemmed less from medieval techniques and more from tāla, a feature of Hindustani music based on isorhythmic principles. A tāla is a repeating rhythmic pattern divided up by strong pulses, and there are numerous common patterns of varying lengths to be found in the music.

The repeating nature of the material I use can be seen to show similar characters, and often sits somewhere between isorhythm and ostinato. Material in my music is often built upon a series of pitches operating within a small section, rather than in a governing role over the whole melody. This again relates to my building-block approach to composing I touched on earlier. I also write contained material using repeating rhythms, which on paper suggests ostinato. But the initiation of gradual changes on every reiteration means that my music does not really fit under either description exactly.

I’ve looked to explore ways of working isorhythmic ideas in structural and melody developmental manners in a number of my compositions. In my percussion piece I was working with ways to loop and layer material in a single line part, adding augmented and diminished versions, and

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Gann, Kyle, *The Music of Conlon Nancarrow* (Cambridge, 1995) p.5

earlier forms, of the material over the top of other forms, as shown below in example 9. In this case rather than a set rhythm with a pitch series of different length, you effectively have two rhythms of different lengths, set together and in the manner of an isorhythm.



Example 9: material construction in Study No.3: Short Shift.

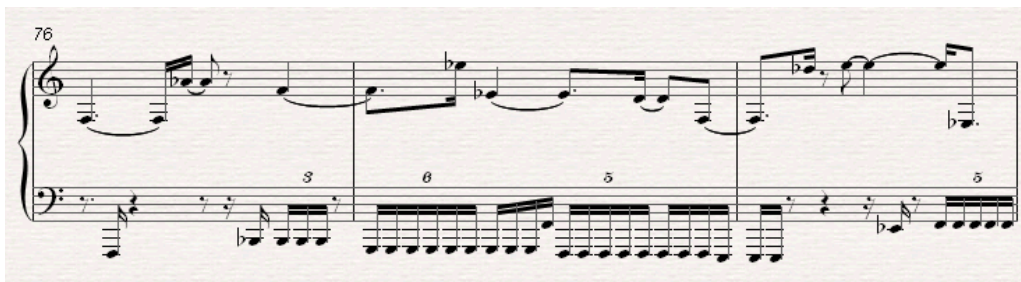
Example 10: Bars 58-61 of Study No.1: Ascension, displaying an example of my use of isorhythm techniques to create suspension.

More true to the technique is the passage shown in example 10, from *Study no.1: Ascension*. It comes about as a result of firstly the gradual expansion of fragmented, semiquavers of material which are then sustained into the gaps which have developed. Although now already in the form of a repeating pattern (the fact the material is still undergoing augmentation upsetting this slightly), this would be fairly hard to identify as a listener. I then freeze the rhythm, effectively

taking a snapshot of the bar and repeating it in the manner of a sticking record. The pitches continue to cycle as they have been however, and so a true isorhythm has been set up. In combination with a quite stationary left hand line of repeating pitches in quintuplet and sextuplet time and you have a passage of music which creates something resembling the suspension I have been discussing.

3.3 Canon

One last area which I feel I should touch upon is canons. With regards to creating cycling structures, this technique is probably the most effective of all. In a true form, I have only touched on working with the technique, most clearly, again, in *Ascension*. This section of material follows on almost directly from the isorhythm section discussed previously and uses almost the same material. I paused the left hand for a crotchet beat, setting in the delay required in a canon. You can see that all the pitch range and class is very different, the shape of the left hand matches that of what has come just before in the right hand. I go on to expand the gap between the two lines slowly, blurring further the relationship between the parts. The gap at the beginning of bar 79 is an early example of the material descending below the range of the piano and so being removed from the music.



Example 11: bars 76-78 of Study No.1: *Ascension*, showing my use of canon.

This is a fairly simple take on the idea compared to some of the approaches by composers such as Nancarrow, who will set out canons at different tempos using ratios, so that the music goes in and out of synch with itself. As a structural device this would most certainly have scope for further investigation in future.

4. Conclusions

These compositions and the methods I've researched and experimented with in this project have proved to be just as much a self study, and I have learnt a lot about my own thought processes which I had not previously considered. For example, the degree to which I approach composing as a methodical, theoretical exercise rather than a creative one, as seen by how I came up with and went about the trigger-based pieces. There is the underlying need for a sense of order to everything I write. This is tempered by the desire to work with material which offers more options to me than simpler material, reminiscent to that of the minimalists, which would suit my writing style better in a number of respects.

The trigger approach as it exists in this project has a limited life in my work. Although I have only explored it in one form, and it would be interesting to expand the structure for an ensemble format, it restricts the overall style of piece I can write. Writing a number of pieces in this format would be entirely possible but the lack of variety would become tedious very quickly I feel. However from trying out these ideas has come firstly an advanced awareness of material development and secondly ideas to further expand on these structural ideas to find a middle ground I am happy with. More preplanning of which processes to use might prove beneficial although I have found predicting the path of a piece even in this format is a challenge. Working through potential processes before committing to them is a time consuming practise, but would be the most effective way to control development to this degree.

Whereas at the beginning of the project I was mostly focused on additive techniques, I have now reached the point where such techniques are far less prominent in my thinking when writing. In addition, and alongside this has come wider changes in material. I was keen to write freer music, which, whilst not necessarily breaking from a tendency to incessant music, broke from everlasting chains of semiquavers and groups of 4. To a point I have achieved this goal, working more with complex time and finding ways to slow the pace of material. I feel I should be looking to take this further in future work.

Structurally, my current thinking is still towards pre-planned layouts which control progression. However in moving away from triggers I am now contemplating chord or harmonic progressions. The idea of having multiple layers moving at different speeds, inspired by canon and isorhythmic techniques. For a current work in progress I am exploring this idea using a series of eight chords, laid out in a progression of fourteen to create the underlying structure of the piece. Over this I reuse these chords on 2 other levels, one as a slow moving isorhythm in the right hand and secondly as a faster, cycling idea in the left. As I suggested in my discussion of canon and

isorhythm, I feel there is much more scope to work with these further, in a structural manner. They offer a consistent but still interesting base to work over, as well as having scope to make interesting pieces in their own right through varying tempo and rhythm. Further to this, one other technique I would like to study further is the removal of material, whilst it continues developing unseen. The idea of having materials that can't be heard, and which slip in and out of the music in different forms is of great interest to me.

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